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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/562,338

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05902/HG

4005

1933 7590 05/15/2007
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EXAMINER

MONDT, JOHANNES P

ART UNIT

PAPER NUMBER

3663

MAIL DATE

DELIVERY MODE

05/15/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/562,338

Applicant(s)

HANAYAMA ET AL.

Examiner

Johannes P. Mondt

Art Unit

3663

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.138(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 February 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) 9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/24/05</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Applicant's election of species A and b in the reply filed on 2/23/07 is acknowledged. Because applicant did not distinctly and specifically traverse the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Regarding the accompanying discussion as to why WO 01/50477 allegedly does not anticipate or render obvious "applicant's claims", such was not so stated, only that the claims do not share a single general inventive concept, while for the specifics applicants are referred to the remainder of the office action.

Applicant is reminded that different Species automatically implies different inventions, which is precluded by Rule 13.2 cited in the Restriction/Election Requirement.

The Restriction/Election Requirement is still considered valid and is herewith made FINAL.

In accordance with Applicant's indication on which claims belong to the elected invention, claim 9 has been withdrawn from consideration.

Specification

The Specification is objected to for the use of an acronym without ever defining its meaning. At least somewhere in the Specification the acronym "MOX" should be defined to mean "mixed oxide".

Claim Objections

1. **Claim 6** is objected to because of the following informalities: the wording "and/or pellet density" should be replaced by ", pellet density, or both pellet diameter and pellet density". Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. **Claims 1 and 4** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hesketh et al (WO 01/50477 A1).

Hesketh et al teach a MOX fuel assembly (see page 1, e.g.) applicable to pressurized nuclear reactors (see page 5, fourth paragraph) wherein the assembly has a lattice arrangement in which a plurality of MOX (i.e., mixed oxide) fuel rods are arranged in n-rows by n-columns (nxn) lattice array, wherein said MOX fuel rods comprise at least two kinds of MOX fuel rods including a plurality of first MOX fuel rods (either 50, or 60) and a plurality of second MOX fuel rods (55), and wherein each of the first MOX fuel rods has a predetermined Pu (plutonium) content (henceforth interpreted in light of the Specification, page 1, line 14, to mean "weight percentage", which also means "enrichment") and a predetermined rod diameter, and each of the second MOX fuel rods has substantially the same Pu content as that of the first MOX fuel rods (page

8, third paragraph: the same enrichment is selected for all MOX fuel rods) and a rod diameter different from that of the first MOX fuel rods (Figure 4 and page 8, second, third and fourth paragraph). The objective by Hesketh et al in their selection of different diameters is the removal of the necessity to have different enrichments otherwise needed to avoid power peaking at the periphery of the assembly (page 1), for which the distribution of Pu (plutonium) in a cross section such as depicted both in the specification (Figure 1) and in Hesketh et al ((Figure 4) the only decisive factor. It would thus have been obvious to recite different Pu weight for the first and second MOS fuel rods, although Hesketh et al do not specifically spell this out.

*Finally, although Hesketh et al do not necessarily teach the limitation on the inclusion of one or more burnable poison "contained" (interpreted as "containing") UO₂ fuel rods in the lattice arrangement (lines 2-3 of claim 1), it would have been obvious to include said limitation in view of Applicant's Admission of Prior Art (see paragraph [0005] of the Specification) teaching of burnable poison containing UO₂ fuel rods (BP fuel rods) arranged as part of the MOX fuel assembly so as to (in effect) reduce Pu content. *Motivation* to include the teaching of the Prior Art as Admitted by Applicant in the invention by Hesketh et al derives at least from the additional degree of freedom offered through the inclusion of BP fuel rods to control and shape the power distribution.*

On claim 4: because in the combined invention defined above the first MOX fuel rods have less Pu weight than the second MOX fuel rods and because the first MOX fuel rods 60 are arranged in the peripheral zone (see Figure 60) the further limitation defined by claim 4 is met.

2. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over Hesketh et al and Prior Art as Admitted by Applicant as applied to claim 1 above, and further in view of Yoshioka et al (5,377,247).

As detailed above, claim 1 is unpatentable over Hesketh et al in view of Prior Art as Admitted by Applicant. Neither Hesketh et al nor Prior Art as Admitted by Applicant necessarily disclose the further limitation defined by claim 2.

However, it would have been obvious to include said further limitation in view of Yoshioka et al, who, in a fuel assembly for a nuclear reactor, in particular including MOX fuel rods, hence analogous art, the cladding of a plurality of fuel rods with a single cladding tube (col. 9, l. 60-66 and Figure 1). Motivation to include the teaching by Yoshioka et al in the invention by Hesketh et al derives from the advantage of economy to use a single cladding tube for more than one pellet.

Furthermore, said first and second MOX fuel pellets in the combined invention are no different from the rods in the absence of a cladding that combines a plurality of pellets. Exactly the same argument in favor of the variation over the cross-section of the fuel assembly of rod radius thus applies to the pellets, which are the essential building units of reactivity. Therefore, to one of ordinary skill in the art it would have been obvious at the time the invention was made to select the pellet diameter of the first MOX fuel pellet to be different from the diameter of the pellets of the second MOX fuel pellet. Furthermore, all rods in Hesketh et al are shown to have substantially the same height (Figure 1) while, moreover, there would be no reason to provide different heights to the rods or pellets because the power distribution problem is completely defined in the

plane of the cross-section taken perpendicular to the direction of the height of the rods and pellets. See page 1 of Hesketh et al.

3. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Hesketh et al and Prior Art as Admitted by Applicant as applied to claim 1 above, and further in view of Koyama et al (6,061,416).

As detailed above, claim 1 is unpatentable over Hesketh et al in view of Prior Art as Admitted by Applicant. Neither Hesketh et al nor Prior Art as Admitted by Applicant necessarily disclose the further limitation defined by claim 3.

However, it would have been obvious to include said further limitation in view of Koyama et al, who, in a patent on a nuclear fuel assembly (see title, abstract and "Background of the Invention"), hence analogous art, teach the concentration of burnable poison containing fuel rods 2 in the corner regions of the fuel assembly (cf. Embodiment 9, col. 13, l. 16-36 and Figure 13), so as to (further) increase the effect of lowering the power in the peripheral region. As this is the very purpose of the invention of Hesketh et al, the explicitly stated reason for concentrating the burnable poison rods in the corner regions provides ample motivation to include the teaching by Koyama et al in the invention by Hesketh et al.

4. **Claims 5-6** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hesketh et al and Prior Art as Admitted by Applicant as applied to claim 1 above, and further in view of Yoshioka et al (5,377,247).

As detailed above, claim 4 is unpatentable over Hesketh et al in view of Prior Art as Admitted by Applicant. Neither Hesketh et al nor Prior Art as Admitted by Applicant necessarily disclose the further limitation defined by claim 5.

However, it would have been obvious to include said further limitation in view of Yoshioka et al, who, in a fuel assembly for a nuclear reactor, in particular including MOX fuel rods, hence analogous art, the cladding of a plurality of fuel rods with a single cladding tube (col. 9, l. 60-66 and Figure 1). Motivation to include the teaching by Yoshioka et al in the invention by Hesketh et al derives from the advantage of economy to use a single cladding tube for more than one pellet.

Furthermore, said first and second MOX fuel pellets in the combined invention are no different from the rods in the absence of a cladding that combines a plurality of pellets. Exactly the same argument in favor of the variation over the cross-section of the fuel assembly of rod radius thus applies to the pellets, which are the essential building units of reactivity. Therefore, to one of ordinary skill in the art it would have been obvious at the time the invention was made to select the pellet diameter of the first MOX fuel pellet to be different from the diameter of the pellets of the second MOX fuel pellet. Furthermore, all rods in Hesketh et al are shown to have substantially the same height (Figure 1) while, moreover, there would be no reason to provide different heights to the rods or pellets because the power distribution problem is completely defined in the plane of the cross-section taken perpendicular to the direction of the height of the rods and pellets. See page 1 of Hesketh et al.

On claim 6: the first MOX fuel pellet and the second MOX pellet, in the aforementioned combined invention meeting claim 4, are different from each other in pellet diameter (loc.cit.).

5. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over Hesketh et al, Prior Art as Admitted by Applicant and Yoshioka et al as applied to claim 5 above, and further in view of Kamimura et al (5,309,493).

As detailed above, claim 5 is unpatentable over Hesketh et al in view of Prior Art as Admitted by Applicant and Yoshioka et al. Neither Hesketh et al, nor Prior Art as Admitted by Applicant, - nor Yoshioka et al, necessarily disclose the further limitation defined by claim 7.

However, it would have been obvious to include said further limitation in view of Kamimura et al, who, in a patent on fuel rods for nuclear reactors, including UO₂ or MOX, - hence analogous art, teach the MOX fuel pellets 1 to have a hole filled with Gd₂O₃ to control excess reactivity and control the local peaking factor (see title, abstract and "Background of the Invention", and col. 2, l. 63 –col. 3, l. 7; Fig. 1). Motivation to include the teaching by Kamimura et al in the invention by Hesketh et al derives at least from the additional control over the power peaking.

6. **Claim 8** is rejected under 35 U.S.C. 103(a) as being unpatentable over Hesketh et al, Prior Art as Admitted by Applicant, and Yoshioka et al as applied to claim 5 above, and, in an alternative rejection, as being unpatentable over Hesketh et al, Prior Art as Admitted by Applicant, and Yoshioka et al as applied to claim 5 above, further in view of Yoshikuni (JP 08-220271 A).

In the combined invention discussed under claim 5, the MOX fuel assembly has a 17-row by 17-column ($n=17$) lattice array (Hesketh et al, Figure 4), wherein said assembly comprises four burnable poison containing UO₂ fuel rods arranged in four corner locations following Koyama et al as discussed overleaf, sixty ($15 \times 4 = 60$) first MOX fuel rods 60 (Figure 1 and page 8 in Hesketh et al) arranged in four peripheral zones (the four sides) in the lattice arrangement except for the four corners thereof (as discussed above through the modification by Koyama et al) and $15 \times 15 - 25 = 200$ second MOX fuel rods 55 arranged in an inner zone (Hesketh et al, Figure 4 and page 8) and a total of twenty-five (25) instrument guide thimbles 65 for guiding instrumentation all disposed in a center location of the lattice arrangement that can also be called an inner zone of the lattice arrangement and disposed in an almost evenly distributed configuration (see Figure 4). Said instrument-guide thimbles 65 could be used for a variety of purposes. The limitations "for guiding in-core instrumentation" and "for guiding control rods" do not *per se* distinguish said first and second guide thimbles as claimed. Applicant is reminded in this regard that intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

Furthermore, in an alternative rejection, even arguing the intended use, it would have been obvious to include the limitation on the distribution of guide thimbles

over one first guide thimble for incore instrumentation and 24 guide thimbles for control rods in view of Yoshikuni, who, in a patent on a MOX fuel assembly, teach to reserve one of said guide thimbles (guide thimble 3) for incore instrumentation in a central location of the lattice arrangement and the remaining 24 guide thimbles 2 for control rods in the inner zone of the lattice arrangement (see English Abstract, "Constitution", and Drawing 1). *Motivation* to include the teaching by Yoshikuni in the invention by Hesketh et al simply derives from the evident need and sufficiency of incore instrumentation and control rods in a MOX fuel assembly of 17X17 fuel rods as shown by Yoshikuni and Hesketh et al.

Moreover, although the numbers in this claim, such as on the rank of the lattice (n) and the number of first MOX and second MOX fuel rods, are actually and somewhat surprisingly exactly found in the prior art as shown above, Applicant is yet reminded that a *prima facie* case of obviousness typically exists when the ranges as claimed overlap the ranges disclosed in the prior art or when said ranges as claimed do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. In re Peterson, 65 USPQ2d 1379 (CA FC 2003). In the underlying case, reasonable departures from the exact values of said numbers would not remove the obviousness of the claimed subject matter, because they are subject to design choice, as their variation in different embodiments by Koyama et al demonstrates.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P. Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JPM
May 11, 2007

Primary Patent Examiner:


Johannes Mondt (TC3600, Art Unit: 3663)